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ABSTRACT

The Beck Depression Inventory (BDI) is a self-reported inventory tapping current feelings only. A short form was published in 1972 consisting of 13 items from the original BDI, called the BDI-SF. In 1978 the original version was modified to eliminate double negative statements and alternative ways of asking the same question and then referred to as the Beck Inventory (BI). The BI is designed to be self-administered, tapping feelings over the past week. The reliability of the 1978 version of the BI and BDI-SF were investigated using an elderly population (N=102) participating in a health promotion program. The internal consistency reliabilities were 0.87 for both forms. Five items on the long form were identified as commonly occurring in an elderly population without depression: weight loss, body image, irritability, loss of libido, and sleep disturbance. The psychometric characteristics of these items were investigated as was their relationship to the total score. Modifying the BI for the elderly to exclude these five items resulted in a 16-item version (BI-E) with an internal consistency of 0.88. Correlations between the BI-E and the other forms were 0.94 or more. Validity was examined through classification structures and correlational patterns with other mental and physical health parameters. (Author/ABL)

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PSYCHOMETRIC PROPERTIES OF THE BECK DEPRESSION INVENTORIES WHEN USED WITH AN ELDERLY POPULATION

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ABSTRACT

The reliability of the 1978 version (BI) and the 13-item Short Form (BDI-SF) of the Beck Depression Inventory forms were investigated using an elderly population participating in a health promotion program (AGE WELL). Five items on the long form were identified as commonly occuring in an elderly population without depression: weight loss, body image, irritability, loss of libido, and sleep disturbance. The psychometric characteristics of these items were investigated as well as their relationship to the total score. A modified version for elderly (BI-E) was suggested.

Aging, Older Adults, Depression, Measurement

ABSTRACT

The reliability of the 1978 version (BI) and the 13-item Short Form (BDI-SF) of the Beck Depression Inventory forms were investigated using an elderly population participating in a health promotion program (AGE WELL). The internal consistency reliabilities were 0.87 for both forms. Five items on the long form were identified as commonly occuring in an elderly population without depression: weight loss, body image, irritability, loss of libido, and sleep disturbance. The psychometric characteristics of these items were investigated as well as their relationship to the total score. Modifying the BI for the elderly to exclude these five items resulted in a 16-item version (BI-E) with an internal consistency of 0.88. Correlations between the BI-E and the other forms were 0.94 or more. Validity was examined through classification structures and correlational patterns with other mental and physical health parameters.

PSYCHOMETRIC PROPERTIES OF THE BECK DEPRESSION INVENTORIES WHEN USED WITH AN ELDERLY POPULATION

INTRODUCTION

The Beck Depression Inventory (BDI) was published in 1961 (Beck et al. 1961). The BDI is a self-reported inventory designed to be administrated by a trained person tapping current feelings only. It provides a consistent and adequate measure of intensity of depression without requiring a clinical psychiatric interview. Since 1961 researchers have attested to its validity and reliability in many settings with various kinds of populations. In addition the BDI has been cited in many studies (Beck & Steer, 1984; Gallagher et al. 1983; Burkhart et al. 1984).

A short form was published in 1972 consisting of 13 items from the original BDI. The short form (BDI-SF) has been shown to correlate at 90% or higher with the BDI and has a correlation of 0.61 with clinical evaluation of depression. (For a description of how the short form was developed, see Beck & Beck, 1972).

In 1978, the original version was modified to eliminate double negative statements and alternative ways of asking the same question (Beck et al. 1979). This forum, referred to as the Beck Inventory (BI), is designed to be self-administered, tapping feelings over the past week.

The scoring patterns for the long forms are similar. However, there is some ambiguity in the literature about the conventional score ranges. When referred to by Lightfoot and Oliver (1985) the ranges were: 0-9: none or minimal depression; 10-15: mild depression; 16-23: moderate depression; 24 and above: severe depression. Other studies, like Gallagher (1986), report the following ranges as conventional: 0-9: normal; 10-15: mild depression; 16-19: mild to moderate depression; 20-29: moderate to severe depression; 30-63: severe depression. The scoring pattern of the BDI-SF is reported as follows:

0-4: none or minimal, 5-7: mild, 8-15: moderate, 16 and over: severe (Beck and Beck, 1972).

It is not always clear in the literature which version of the long form of the depression inventory and which scoring scheme was used in any particular study. However, research appears to substantiate that all three forms correlate well (0.90 or more), correlate at 0.55 or better with clinical diagnosis, and have construct validity. Two and three week test-retest reliabilities were 0.90 (BI) and 0.79 (BDI) respectively (Lightfoot & Oliver, 1985). Internal consistency of the forms has been reported as 0.86 (BI) and 0.88 (BDI) (Beck and Steer, 1989).

All three forms function as a quick and easy tool to reflect changes in depth of depression over time. They can be administered by a trained interviewer (BDI) or be self-administered (BI and BDI-SF) rather than requiring a psychiatrist or clinical psychologist. Furthermore, all the inventories provide a consistent measure and are not sensitive to the predilection of an interviewer's biases, providing information which can be compared to other studies.

In 1984 AGE WELL, a health promotion program for the elderly in Tucson, Arizona, began to collect baseline information on participants in various aspects of their lives: home safety, activities of daily living, stress, exercise, and so forth. The screening instrument used to measure depression was the BI which participants completed as part of a larger screening instrument when they first entered the program. Re-administration of the BI has been done at yearly intervals (Watkins, 1988).

While AGE WELL has used the BI as a screening tool to measure depth of depression in the elderly, it has recognized that the BI was not developed and validated on a non-clinical elderly population. It was therefore of interest

to investigate how well the BI worked in an elderly population in a health promotion setting. Elderly populations merit special consideration because they suffer from stresses and grief of loss associated with old age, and are more dependent on others for daily needs. They are also undergoing somatic changes of normal aging (Salzman & Shader, 1979; Seligman, 1972). Accepted symptoms of depression in younger adults may be part of normal aging for the elderly, and the contribution of certain items of the BI might be less related to depression in the elderly than in a younger population.

When Beck and Beck (1972) set out to find a reliable shorter version of their depression inventory, they used a strictly statistical approach. They began with two basic requirements: (1) the shorter version should be highly correlated with the long form, and (2) it should have maximum correlation with clinical evaluation of severity of depression. This means they did not subjectively evaluate the content of the questions for their relevancy to an elderly population. Neither did they compare results across age groups.

For non-depressed elderly, certain questions on the BI are of questionable validity. In particular, these are questions highly influenced by the aging process: loss of libido, weight loss, body image, irritability, sleep disturbance, and fatigability.

Furthermore, these items could also be related to the physical manifestations of disease. Since an older population has a higher incidence of chronic health problems, these items could produce spuriously high scores. Some evidence of this was found when Zemore extracted somatic complaints from the BDI in a depressed sample of elderly. The scores for younger adults on the remaining items were not significantly different from the scores of the elderly (Zemore & Eames, 1979). On the other hand, one needs a reliable way to screen for depression in the elderly because many physicians not trained in

psychology or psychiatry, when working with the elderly, dismiss too many characteristics of depression as unimportant or due to a natural consequence of being old (Frengley, 1987) in truly depressed subjects.

METHOD

One hundred and two AGE WELL participants took the BI. AGE WELL participants are primarily female (80%), white (91%), retired (65%), and low income (68% with less than $10,000 per year). Educational background is fairly evenly distributed across four categories: less than a high school graduate (27%), high school graduate (29%), some college (26%), college graduate or professional degree (18%). Those participating in the study ranged in age from 60 to 86 with a mean age of 71 (S.D. = 7.0). Also, the majority of them did not have clinical signs of depression (89%) as determined on initial screening/interview by the program's medical director, a family physician/geriatrician.

The 13 questions of the BDI-SF are embedded in the BI and include the items on sadness, pessimism, sense of failure, dissatisfaction, guilt, self-dislike, self-harm, social withdrawal, indecisiveness, self-image change, work difficulty, fatigability, and anorexia. Both forms were tested for internal consistency using alpha coefficients.

In order to find whether a subscale of items from the BI would be highly reliable and much more specific to an older population, or whether the cutoff scores for depression on the BI could simply be raised to account for spuriously high depression scores among the elderly, the six items highly influenced by the aging process were examined for their relationship to the entire scale. If a shorter version could categorize participants in the same way as the BI and the BDI-SF, evidence for its construct validity would

exist. (This method was attempted by Gallagher et al. (1982) on different items without significant success.)

To further investigate the impact of the ear-marked items, a comparison of their item scores and subscale score was made among three groups: non-depressed older adults, depressed older adults, and younger adults. To obtain the depressed and non-depressed older adults, an evaluation of participants for clinical signs of depression was made on an initial screening/interview by the program's medical director, a family physician/ geriatrician. Eleven participants were diagnosed as depressed (11%) and 90 were diagnosed as non-depressed (89%). (Information was incomplete on the other participant.) The younger adults consisted of a random sample of 16 faculty and staff in the department of family and community medicine at the University of Arizona. Ages ranged from 28 to 58 with a mean age of 42. They were primarily female (88%), caucasian (75%), and had some college-type education or degree (100%). Their incomes averaged less than $25,000 (69%).

If non-depressed and depressed older adults differ significantly on the 5 items, it would suggest that the items were sensitive to assessing depression in the elderly. If the non-depressed older and younger adults responded significantly differently on the 5 items, that would suggest using a different cut-off score for measuring depression in the elderly using the BDI.

Participants rated themselves on perception of mental and emotional health (M), satisfaction with life (SL), physical health (P), and amount of interference in life activities due to health troubles (HT). These ratings were compared with depression scores to provide evidence of concurrent validity.

The percentage of participants falsely classified as depressed or non-depressed was determined for the non-depressed and non-depressed elderly

groups respectively on each of the subscales. This allowed further examination of elevated scores on the BI among the elderly, and the contribution of the 5 items toward discriminating between depressed and non-depressed elderly.

RESULTS

The results of the tests for internal consistency for BI and BDI-SF were both 0.87. The Pearson correlation between forms was 0.94.

Using the SPSS reliability program, correlations between items and with the total depression score (BI) were obtained. Four of the ear-marked items were among the five lowest corrected item-total correlations. These four items had an average inter-item correlation of less than 0.24. Out of the 19 inter-item correlations of less than 0.10, 12 (63%) of them involved these four items. If any one of these four items were deleted, the reliability of the new 20-item scale would remain at 0.87 (irritability or body image) or rise to 0.88 (loss of libido or weight loss). Table 1 shows the relevant statistics.

Table 1

Inter-item Correlations and Reliabilities for Selected Questions on The Beck Inventory Using Entry Data

Item	Corrected Item-Total Correlation	Minimum Inter-Item Correlation	Maximum Inter-Item Correlation	Average Inter-Item Correlation	If Item Deleted
Weight Loss	0.3370	-0.0030	0.2974	0.175	0.88
Body Image	0.3440	0.0044	0.4259	0.179	0.87
Irritability	0.4139	0.0593	0.3051	0.215	0.87
Loss of Libido	0.4811	0.1123	0.3975	0.239	0.88

Following a similar pattern of examination, deleting all four items would increase the reliability from 0.87 to 0.88.

The two items on sleep disturbance and fatigability had relatively high correlations with the total scores: 0.50 and 0.58 respectively. However, looking at their effect on reliability after deleting the four items, it was found that deleting the item on sleep disturbance would raise the reliability to 0.89, but no change would be made by deleting the fatigability item.

Sleep patterns, especially sleeping fewer hours during the night, are related to decreased activity which, in turn, tends to be a typical pattern for the elderly (Dement et al. 1982; Kales, 1967). Deleting this item, along with the other four items, resulted in a 16-item depression scale with higher alpha reliability than the BI or BDI-SF. We refer to this scale as the Beck Inventory for Elderly (BI-E). The correlation of the 16-item BI-E with the BI is 0.97 and with the BDI-SF is 0.96.

The pattern of correlation between item and total scores and the average item means for the three forms are given in Table 2. The codes for the questions follow the numerical values when appropriate and are explained below. The numbers of subjects remain at 102.

Table 2

A: Correlations Between Items and Total Scores For Three Beck Inventory Forms

Scale	Between Items Low	Between Items High	Average	With Total Score Low	With Total Score High
BI	-.0030 (H,S)	.7295 (C,F)	.3000	.3804 (S)	.7472 (A)
BDI-SF	.0340 (C,N)	.7042 (B,E)	.3646	.4685 (N)	.7828 (B)
BI-E	.0465 (F,L)	.7295 (C,F)	.3578	.4522 (O)	.7751 (B)

B: Range of Item Means and Mean Score For Three Beck Inventory Forms

Scale	Item Means Low	Item Means High	Score Average	Score Mean	Range
BI	.0980 (I)	1.2160 (U)	.3749	7.87	0-63
BDI-SF	.0980 (I)	.8824 (Q)	.3017	3.92	0-39
BI-E	.0980 (I)	.8824 (Q)	.2990	4.78	0-48

A: Mood B: pessimism C: sense of failure F: sense of punishment H: self-accusation I: suicide K: irritability L: social withdrawal S: weight loss T: somatic preoccupation U: loss of libido Q: fatigability O: work inhibition N: body image E: guilt R: loss of appetite

The average correlation between items is similar in the BDI-SF and BI-E and much improved over the BI. A similar pattern is seen among the forms with correlations between items and with the total score. The average item means were highest in the BI and result from the higher responses on the loss of libido item. The loss of interest in sex for the elderly, however, is often a function of age and personal situation, such as death of a spouse, or use of certain medications (Ham, 1986). Under these circumstances, the average item mean is spuriously high.

The average scores are also given in Table 2, along with the score range. The scoring pattern of the BI-E was determined to be: 0-6: none or minimal, 7-11: mild, 12-14: moderate, 15-21: mod/severe, 22 and over: severe. This pattern was derived by adjusting the scoring pattern of the BI to a 16 item scale. Although the score weights may not be equal across items, actual score weights are unknown. Regardless of form, the average score was consistently in the none or minimal depression range.

Table 3 shows the distribution of depression scores based on the three forms and the perception of Physical Health, Life Satisfaction, and Health

Troubles for the total group divided among the four perceived Mental and Emotional Health categories: excellent, good, fair, poor. There were no significant differences between scores among the depressed and non-depressed older adults.

Table 3

Agreement between Beck Inventory Forms, Perceived Physical Health, Satisfaction with Life and Health Troubles and Perceived Mental Health Categories On 101 Older Adults.

Mental Health Group	BI (Category)	BDI-SF (Category)	BI-E (Category)	P[1]	SL[1]	HT[2]	N	Average Age
Excellent	4.04 None or Normal	1.79 None or Minimal	2.04 None or Minimal	1.9	1.3	1.4	28	76
Good	6.89 None or Normal	3.34 None or Minimal	4.04 None or Minimal	2.3	2.8	1.7	53	71
Fair	14.90 Mild	7.95 Moderate	9.85 Mild	2.8	2.9	2.1	20	72
Poor	(No cases)							

1: 1=excellent, 2=good, 3=fair, 4=poor

2: 1=not at all, 2=a little, 3=a great deal

It can be seen from Table 4 that the BI-E categorizes the elderly sample the same way the BI and BDI-SF do, regardless of the scoring scheme used for the BI.

The BI-E and BDI-SF both eliminate items on irritability, self image, sleep disturbance, weight loss, and loss of libido. In contrast, the BI-E also eliminates the question of self-image. This question is likely to draw an elevated score from elderly both because of natural age-related physical changes and disfiguring illnesses which they are more likely to have

experienced. On the other hand, the BDI-SF eliminates the questions on punishment, self-blame, crying and worrying about health. According to research, (Bibring & Klerman 1974; Hirshfield 1979; Masserman 1970; Minkoff et al. 1973), two reliable symptomatic indicators of clinical depression are lowered self-esteem and feelings of hopelessness and helplessness. At least three of these four questions are products of low self-esteem and helplessness. It is likely that low self-esteem indicators are just as appropriate for the elderly as for younger adults. Therefore, eliminating these items may seriously diminish the discriminating power of the resulting instrument to assess depression in any aged adult.

One-tail t-tests for independent groups were made between the various groups on the 5 selected items and subscales. Results are summarized in Table 4.

Table 4

Significance Levels of One-Tail t-Tests Between Three Adult Groups

	DO vs NDO	DO vs YA	NDO vs YA
Irritability	.33	.45	.23
Body Image	.43	.27	.11
Sleep Disturbance	.12	.00	.00
Weight Loss	.13	.07	.20
Loss of Libido	.01	.00	.00
Subscale of 5 items	.02	.00	.02
BI	.05		
BI-E	.05		
BDI-SF	.07		

NDO = non-depressed older adults (n=90)
DO = depressed older adults (n=11)
YA = younger adults (n=16)

Table 4 shows that the item on sleep disturbance does not discriminate between depressed and non-depressed older adults but rather seems to be confounded by age. Additionally, the item on loss of libido not only discriminates between depressed and non-depressed adults (any age) but also between younger and older adults. Furthermore, one would expect the greatest differences in items to be found between the younger adults and depressed older adults. Such differences are not readily apparent especially with the irritability and body image items. As a subscale, the 5 items together discriminate between all pairs of the groups at the 5% level of significance.

It appears that the BI itself is not a very good screening instrument for the elderly ($p = .05$) and the BDI-SF is even less so ($p = .07$). Separating out the 5 items however results in a scale of 16 (BI-E) which performs similarly to the BI ($p = .05$).

The responses of older adults were further examined to see how the 5 items compared with the remaining 16 (BI-E) items. One-tail paired t-tests, correlations and mean item scores are found in Table 5.

Table 5

Significance Levels of One-Tail t-Tests, Mean Item Scores and Correlation Between Non-Depressed and Depressed Elderly on the BI-E and 5-Item Subscale.

	P	Mean item (5)	Mean Item (BI-E)	Correlations
DO	.027	.91	.61	.91*
NDO	.000	.57	.25	.61*

DO = depressed older adults
NDO = non-depressed older adults
* significant at = .01

Table 5 shows both the depressed and non-depressed older adults perform differently on the BI-E and the 5-item subscale, although the difference is stronger among the non-depressed elderly. However, the mean item responses on

both subscales are higher for the depressed elderly than the non-depressed elderly. In fact, the mean item score for the depressed elderly on the BI-E is not much higher than the mean item score for the non-depressed elderly on the 5-items. This suggests elevated scores on all BDI items for elderly.

The percentage of false negatives and false positives for all forms for those clinically diagnosed as depressed or non-depressed is given in Table 6.

The five ear-marked items together yielded 54.5% false negatives in a depressed elderly population and 37.8% false positives in a non-depressed elderly population. However, only 13% false positives occurred with these 5 items in the younger group.

In this study, cutoff scores that minimize the total number of false positives and false negatives for each form are: 13 through 63 for the BI (69%), 11 through 48 for the BI-E (76%), and 5 through 15 for the 5 items (79%). In the case of the BI and the 5 items, the number of false negatives for the depressed group is still close to chance. Fewer false positives, however, are found among the non-depressed group under the new cutoffs.

Table 6

Classification of Depressed and Non-Depressed Elderly Into False Negatives and False Positives by Form.

	Depressed Elderly (n = 11)		Non-depressed Elderly (n = 90)	
Form	% Depressed	% Non-depressed	% Depressed	% Non-depressed
BI	27.3	72.7 false -	4.4 false +	95.6
BI-E	18.2	81.8 false -	3.3 false +	96.7
BDI-SF	18.2	81.8 false -	2.2 false +	97.8
5 items	45.5	54.5 false -	37.8 false +	62.2

Cut-off scores for depressed adults: 17 through hi (BI); 13 thru hi (BI-E); 11 through hi (BDI-SF); 4 through hi (5 items)

DISCUSSION

Depression is the most prevalent mental disorder as well as the most prevalent missed or misdiagnosed problem in the elderly (Chaisson-Stewert, 1985). Popular psychological tests which identify and measure severity of depression have not been designed for elderly. In particular, the BI is inherently weak because items related to physical and negative signs of depression also relate to chronic health problems and normal aging.

Modifying the BI by eliminating 5 of the items (loss of libido, weight loss, body image, sleep disturbance, irritability) resulted in a shorter and somewhat more reliable version for the elderly. It also performs about the same as the BI in screening depression for the elderly. A depression inventory with fewer items, but with discriminatory power and high reliability to screen for depressed elderly is desirable because older adults tire easily and often have vision problems. Additionally, when working with an elderly population in a health promotion setting, a depression inventory is not usually the only screening exam given. Being able to eliminate several questions on each subscale, for example, would greatly reduce the time needed to complete screening.

While the 5-item results in fewer errors of designating depressed elderly as non-depressed, the number of errors is virtually chance. In a non-depressed elderly population, however, the number of elderly falsely being designated depressed increases considerably. If the effect of the 5 items were consistent with the rest of the items, the percentage of false positives and false negatives would be about the same. The BI and BI-E also are not significantly different with respect to the proportion of false negatives and false positives generated in screening, suggesting the 5 items do not add significantly to screening for depression in the elderly.

The 5 items were responsible for inaccurately identifying 38% of non-depressed subjects as depressed. Although, the remaining 16 items (BI-E) were not sensitive enough to identify 82% of the depressed subjects, the BI fared little better with a 73% error, and the total number of errors for both forms was the same.

Furthermore, in the 5-item subscale, it appears that the items (except for sleep disturbance) either discriminate between all the groups or do not discriminate between any of them. Their value as part of a screening instrument is questionable. Even the 5 items collectively could only discriminate between the young adults and the depressed older adults (p .01).

If all BI items are equally elevated in an elderly population, one would expect raising the cutoff score would produce better discrimination between depressed and non-depressed elderly. However, in this study, fewer total errors were produced by lowering the cutoff score.

Screening instruments for measuring depression are sought for use in comprehensive geriatric assessment settings by geriatricians. The search for an adequate screening tool for the elderly apparently cannot be found by simply raising the cut-off scores or eliminating somatic items from existing tools such as the BI due to the confounding of signs of depression with normal aging processes.

Further research is needed to test how well the modified scale (BI-E) works in other elderly populations. Other researchers may have subsamples of elderly from their original study large enough to re-analyze their data using the modified BI for elderly. However, it appears the inherent weakness in the BI as a screening tool for the elderly is unlikely to be overcome.

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